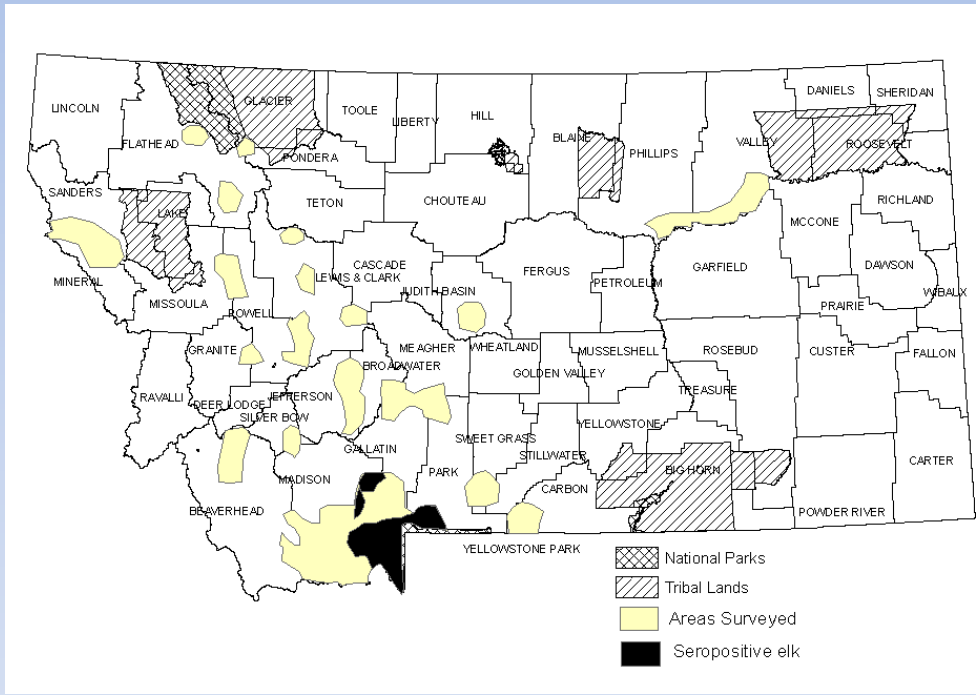
Surveillance for Brucellosis in Elk 2008 thru 2010

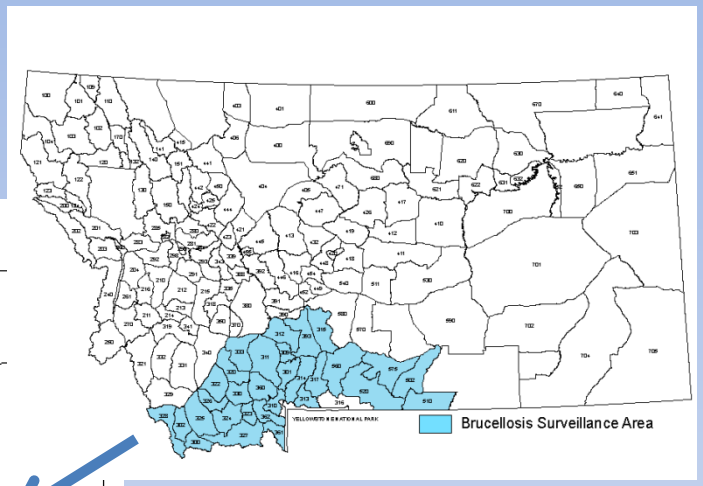
Montana Fish, Wildlife and Parks

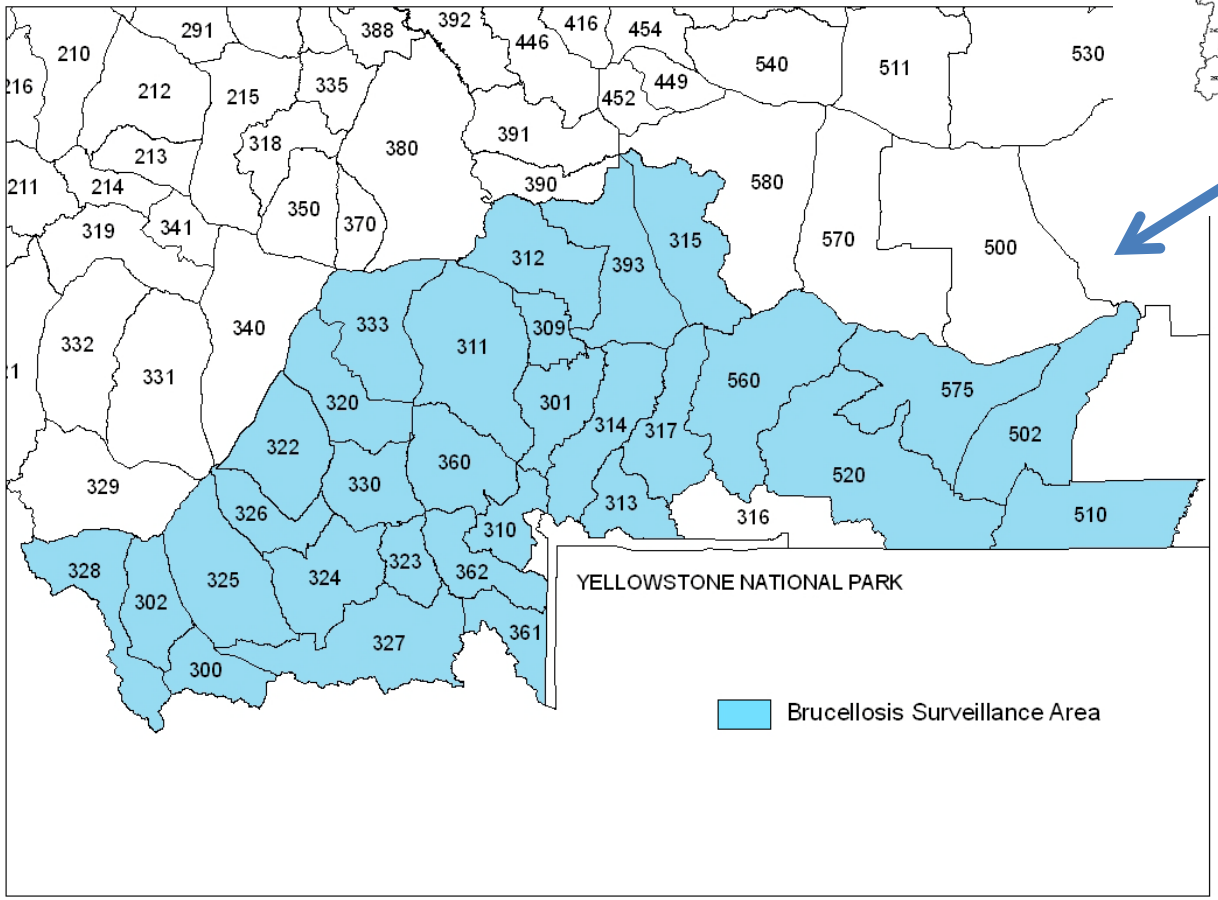
Surveillance History

- Started in early 1980's
- Conducted over much of Montana
- Recent surveillance focused on GYA
- 2008 - present
  - Determine geographic distribution



Survey Area
2008 - Present

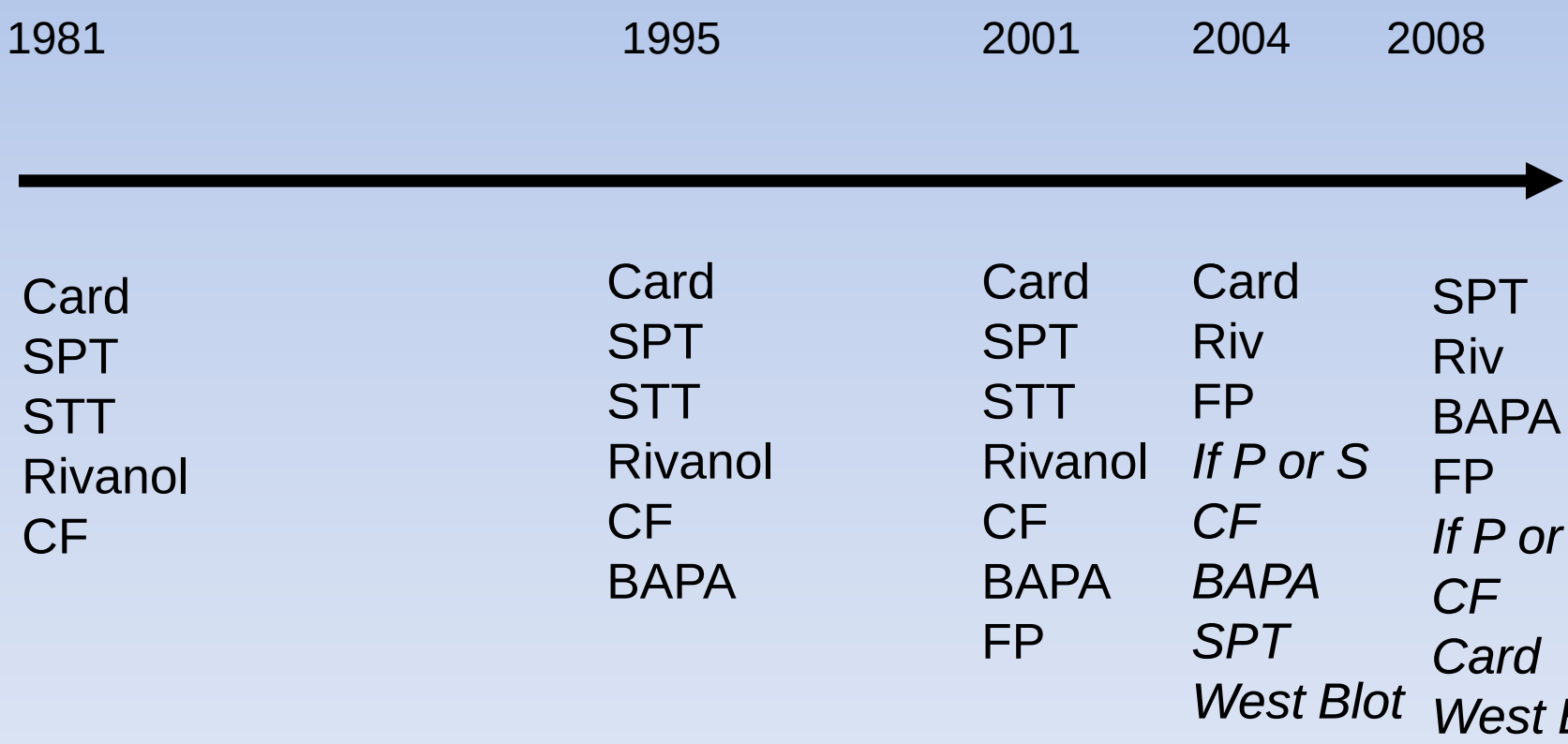




Blood Testing Protocol

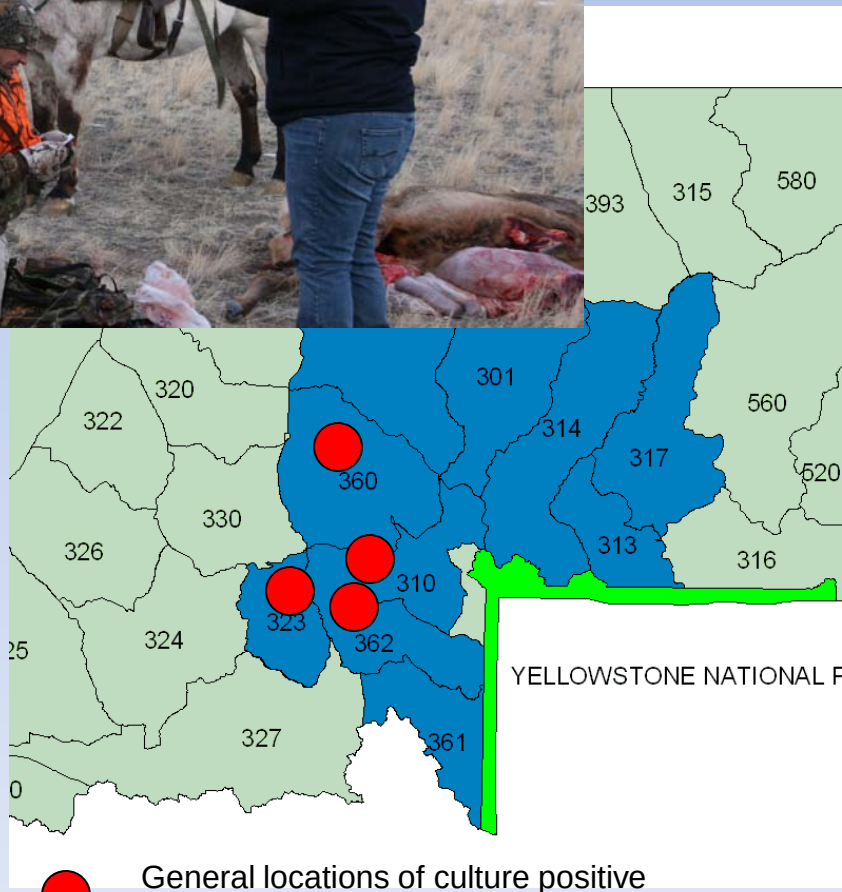
- Hunter harvest
- Research
- Standard serologic tests
- Western Blot
  - 2004
  - Cross Reactions
  - Not Validated in Elk
  - Only tool we have
  - Currently under review by USAHA Brucellosis Scientific Committee

Tests Used


1981
1995
2001
2004
2008
Card
SPT
STT
Rivanol
CF
Card
SPT
STT
Rivanol
CF
BAPA
Card
SPT
STT
Rivanol
CF
BAPA
FP
Card
Riv
FP
If P or S
CF
BAPA
SPT
West Blot
SPT
Riv
BAPA
FP
If P or S
CF
Card
West Blot

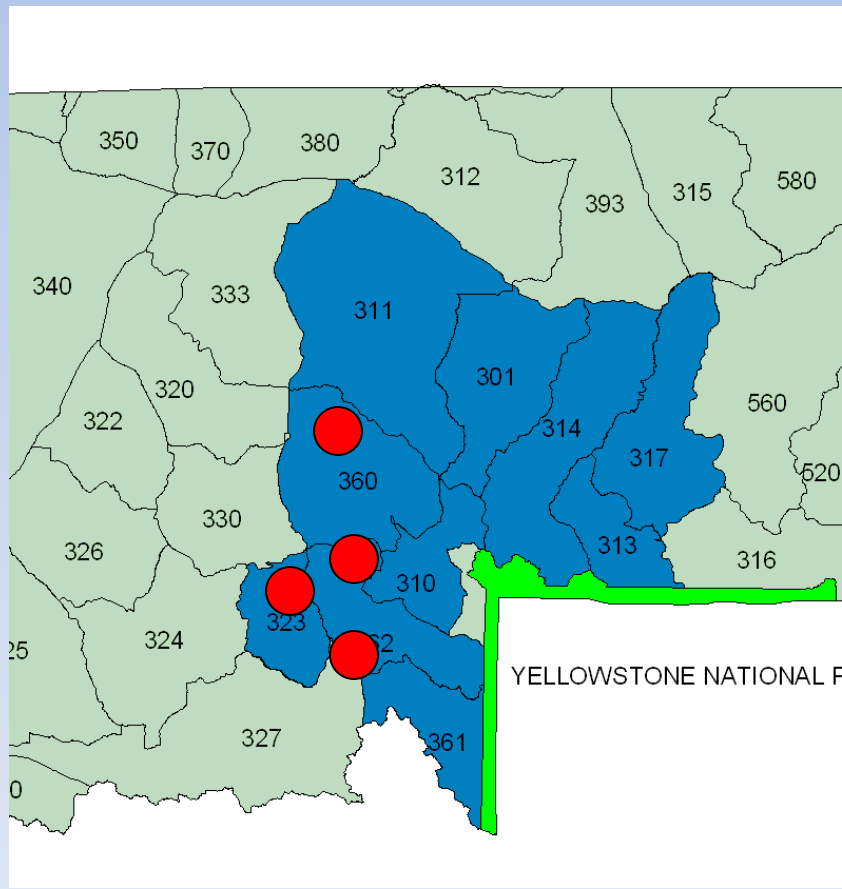
Tissue Collections

- 2008 - present
- Backtracking to kill sites
- Head collections
  - Conjunction with CWD survey
- Increase # isolates
- Obtain matching blood/tissue samples from an individual elk

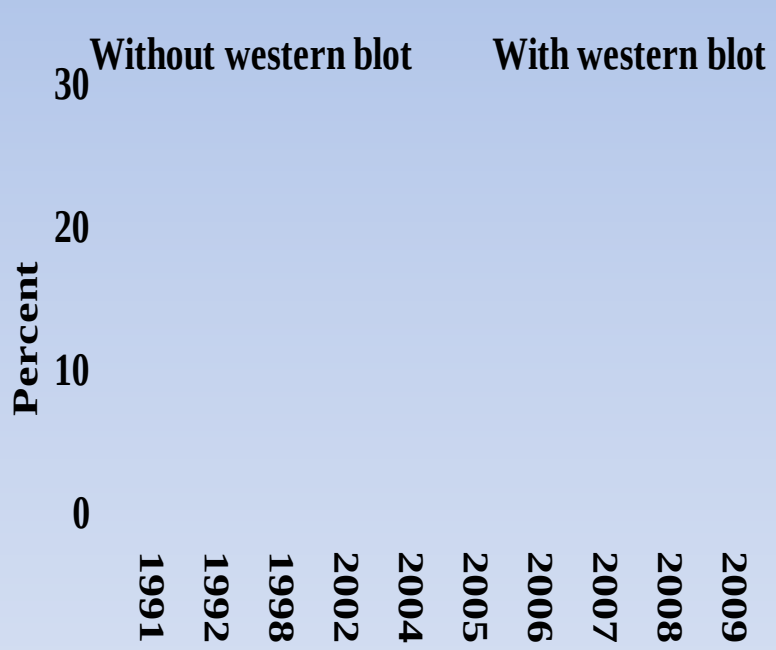


What is the difference between seropositive and culture positive?

- Positive or reactor on serologic tests
  - Considered seropositive
  - Indicates exposure not infection
  - About 50% of seropositive animals are culture positive
    - Dependent on number and quality of tissues sampled
- Seroprevalence
  - % of animals that test positive on serologic tests
- Culture positive
  - Confirms infection
  - Bacteria may be present in animal but not able to culture in tissues
    - Wrong tissue, bacteria died during processing, just didn't grow in lab, etc.

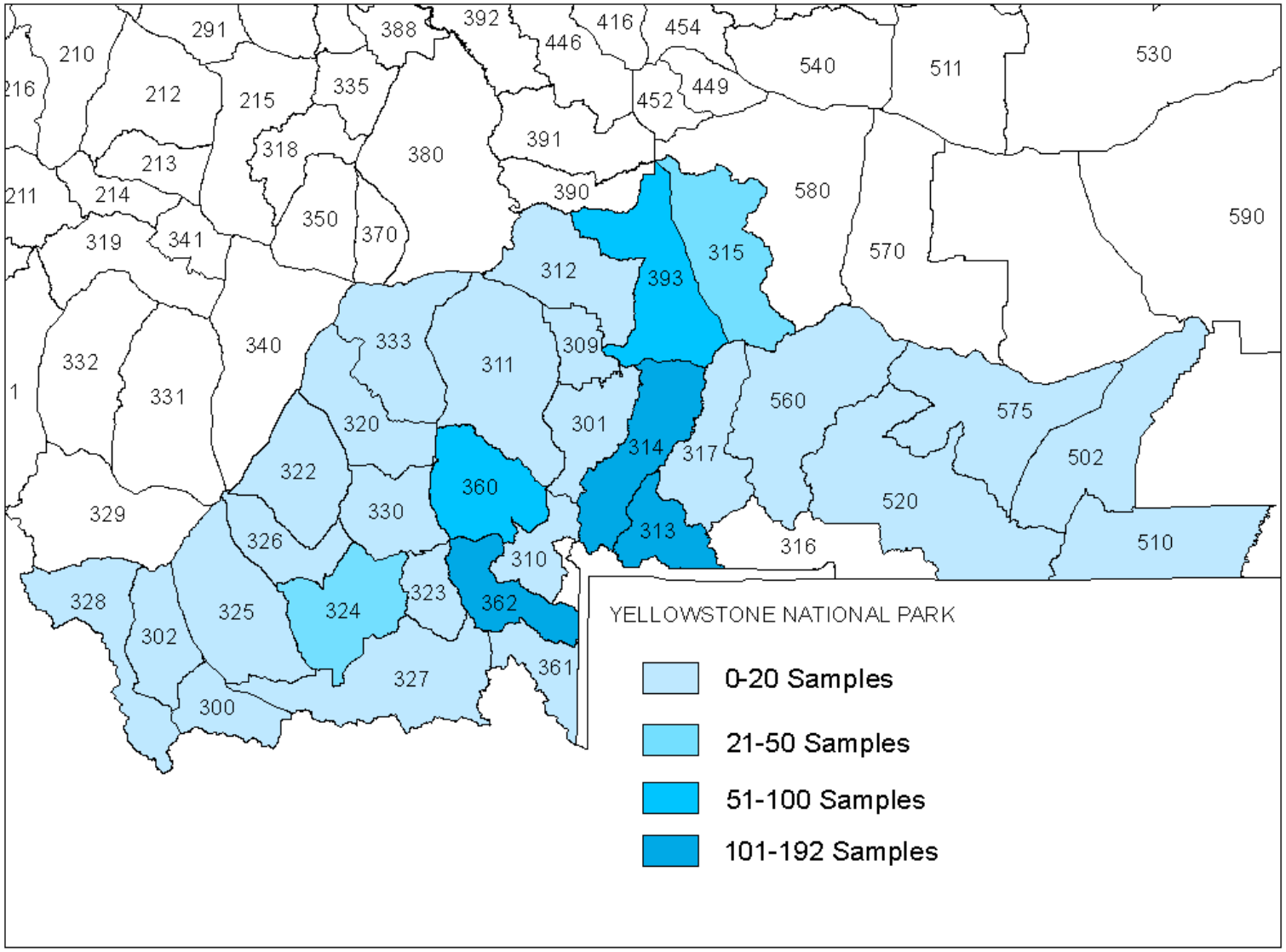


Reporting Serologic Results

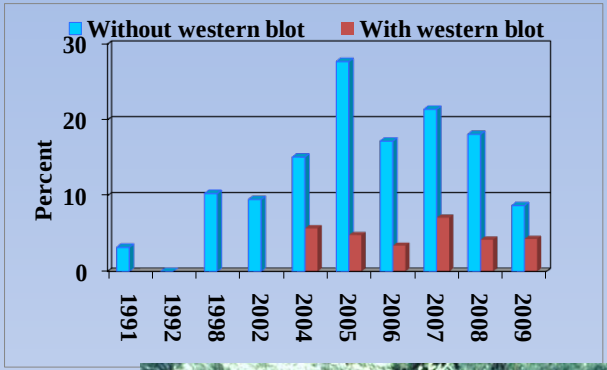


- Concerns over use of western blot
- Cross reactions could occur
- Report both with and without use of western blot
- Values are an estimate
  - Confidence intervals

Sample Sizes
2008-09 and 2009-10

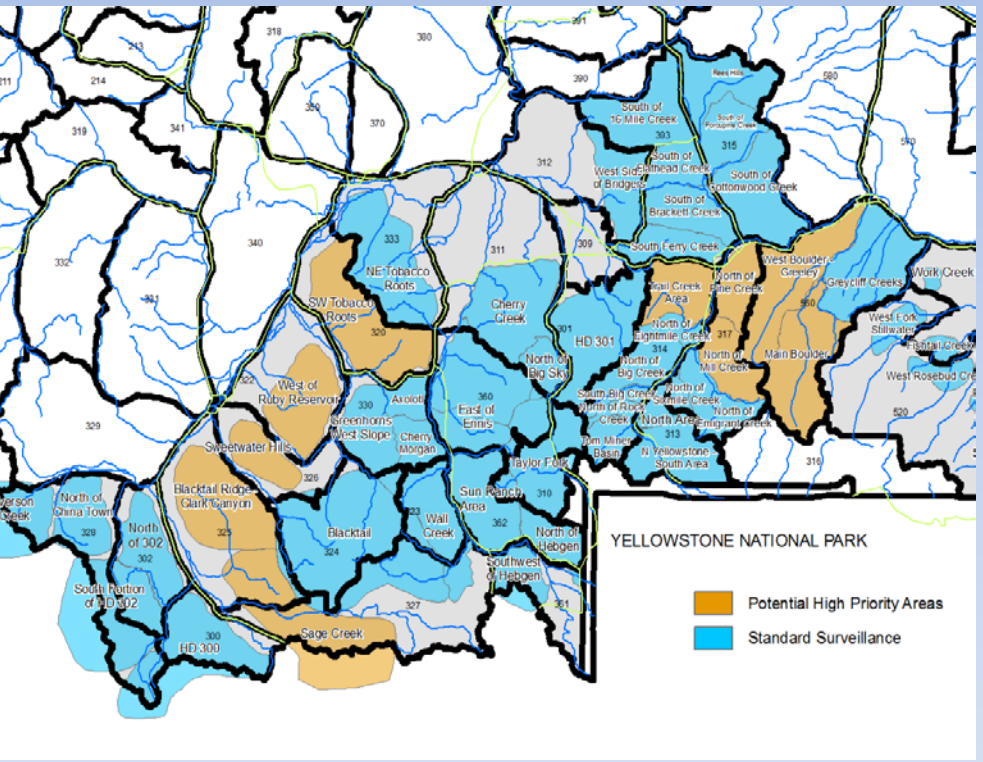


New Strategy - Three Phases



- Develop long range plan
- Surveillance
  - Geographic distribution
  - Seroprevalence
- Brucellosis research/evaluation
- Elk movement research

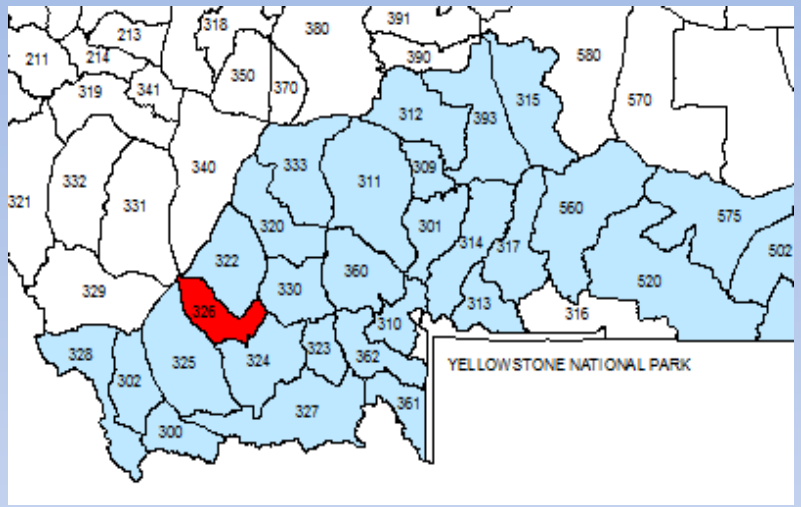
Targeted Surveillance & Research



- Identify high priority areas
  - Use existing data, current modeling efforts, research data, management needs, landowner support
- Conduct in 5 different areas
  - One area per year
- Dependant on funding

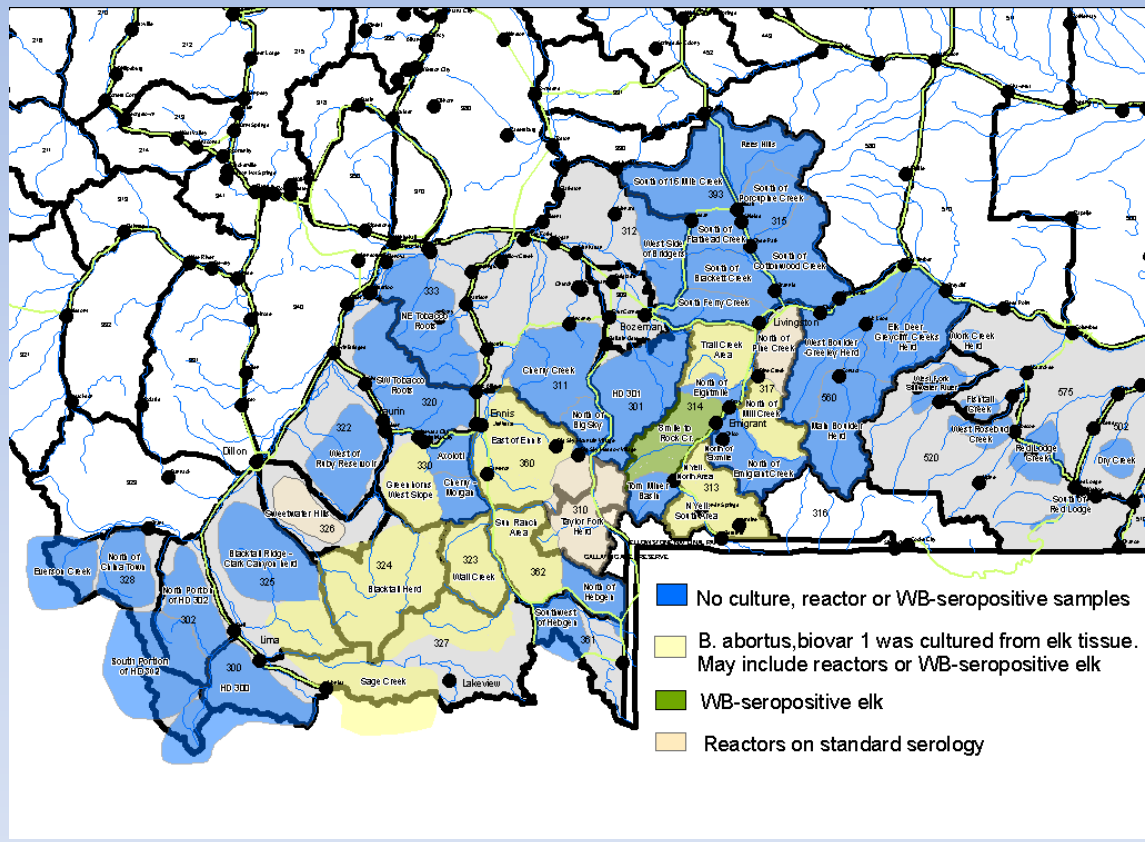
Surveillance

- Large area
  - Maintain hunter harvest surveillance
- Targeted
  - Focus on an area of concern
  - Utilize hunter harvest and live animal capture
    - Improve sample size
    - Capture ~100 elk
    - 50 Hunter harvested samples



Surveillance Outcomes

- Determine the presence/absence
- Improve understanding of distribution
- Baseline information on seroprevalence



Epidemiology

- Collar seropositive adult female elk
- Implant seropositive pregnant
- Monitor abortion/birth events
- Collect and test abortion/birth tissue
- Recapture and repeat for four additional years
- Remove seropositives, necropsy and test after five years

Epidemiology Outcomes

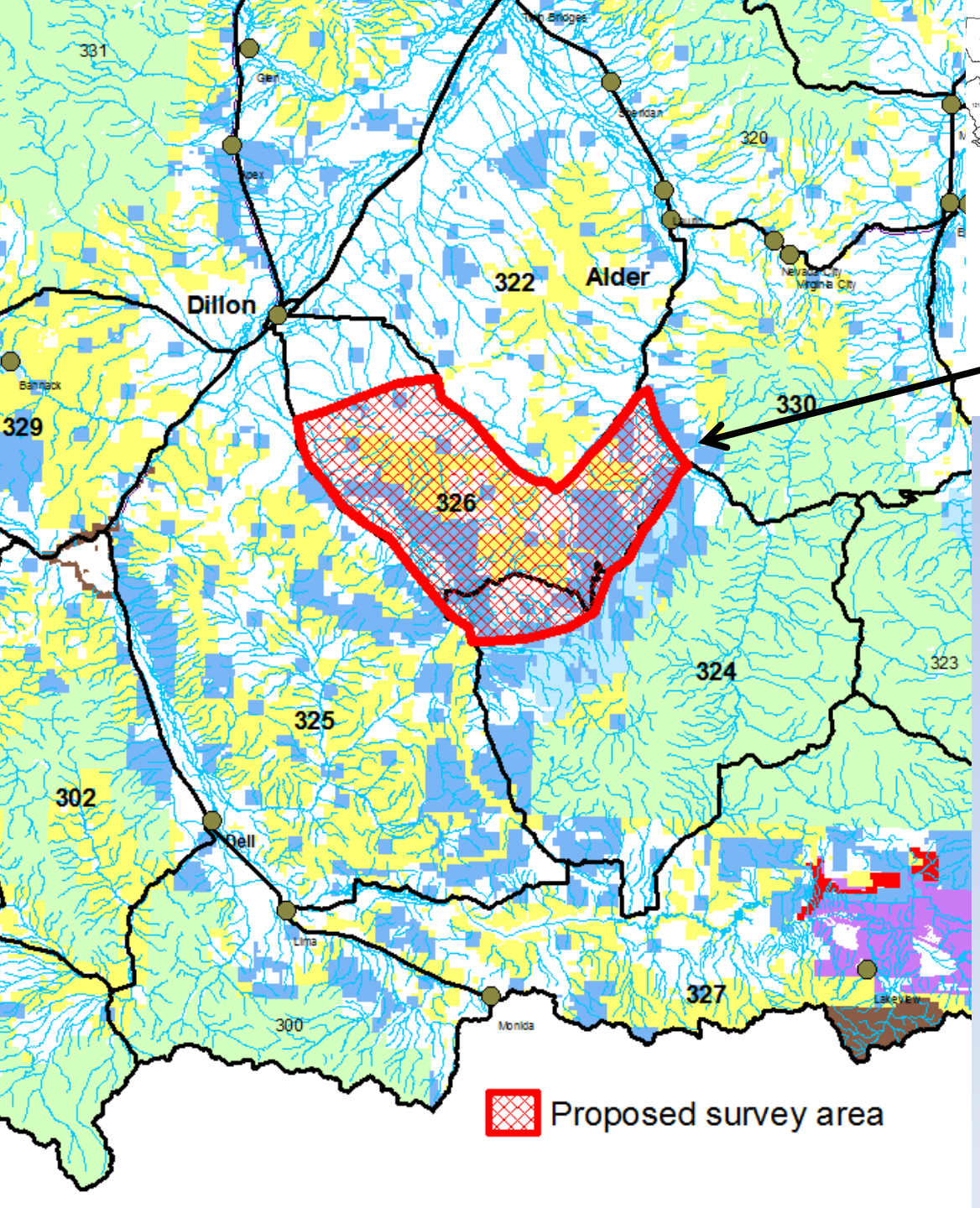
- Evaluate sero-status
- Determine risk of seropositive animals
  - Ability to shed *B. abortus*
- Additional information to evaluate testing methodology
- Increase number of isolates for comparison to other areas
- Difference in seropositive/seronegative movements

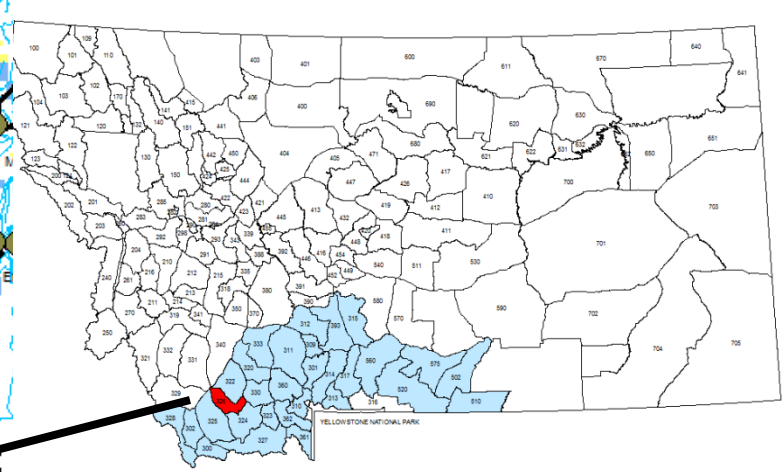
Elk Movement Research

- GPS collar 30 adult female elk
  - Records locations every 2 hours
- Track twice a month
- Pick up collars/data in January of following year

Movement Research Outcomes

- Determine movement patterns of elk
- Improve risk assessments for transmission
    - Elk - Cattle & Elk - Elk
- Improve understanding of brucellosis distribution
  - Future surveillance
  - Develop/improve risk models
- Better understanding of factors affecting brucellosis distribution and increasing seroprevalence





2010-11 Study Area

Results

Targeted Surveillance & Research

- 100 cow elk tested
- 8 potential reactors
  - Card test in field
- 5 pregnant
  - Implanted with VITS
  - One expelled VIT early
  - Remaining 4 carried calf to full term
  - Swabs of VITs culture negative
- 4 additional reactors
  - MT Dept. of Livestock Diagnostic Lab
- 2 of 12 brucellosis positive on WB

2008-09 thru 2010-11

- Blood samples
  - Pooled over three years
- 1031 adult female
- 263 adult male
- Focused on adult female elk
  - Primary concern for spreading brucellosis
  - Best indication of brucellosis presence

- Tissue Samples
  - Pooled over three years
- 644 Samples
  - 545 female
  - 99 males
- 19 Culture positive
  - *B. abortus* biovar 1

Serology Results

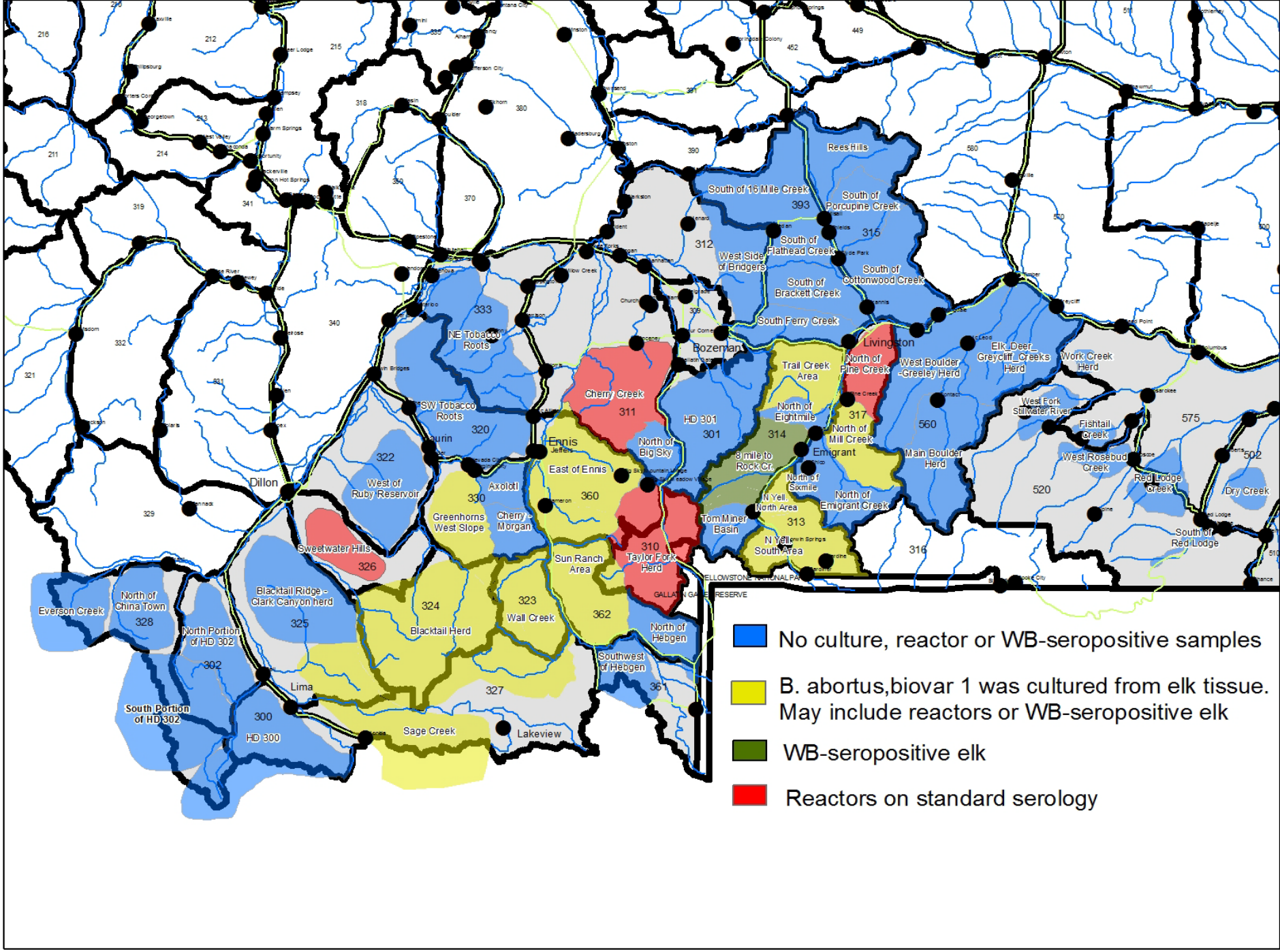
Adult Females

2008-09 thru 2010-11

HD	Samples	Reactors without WB	Reactors with WB	# Cow elk - 2007/08
311	20	2 (6.9%)	1 (3.4%)	
313	118	17 (14.4%)	9 (7.6%)	~3,000
314	230	13 (5.6%)	5 (2.2%)	~2,800
317	21	4 (19.0%)	0	~490
323	13	4 (30.8%)	0	~2,000
324	26	3 (11.5%)	0	~100
326	106	14 (13.2%)	2 (1.9%)	~1,600
327	20	1 (5%)	0	~1,500
360	105	8 (9.0%)	2 (1.9%)	~1,400
362	137	23 (16.8%)	5 (3.6%)	~1,600

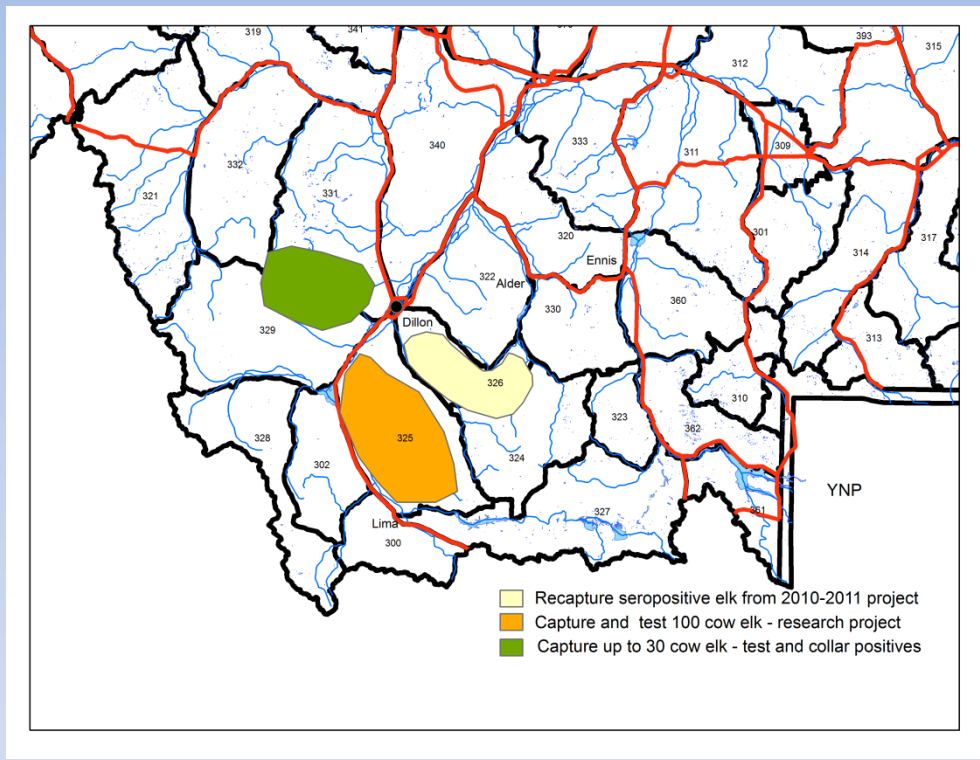
Blood and Culture Results

Serology	WB Results	Culture Results	Samples
Negative	Not tested	B. abortus not detected	213
Negative	Not tested	B. abortus, biovar 1	1
Reactor	Yersinia	B. abortus not detected	11
Reactor	Brucella and/or Yersinia	B. abortus not detected	6
Reactor	**Brucella and/or Yersinia**	**B. abortus, biovar 1**	**3**
Reactor	**Yesinia**	**B. abortus, biovar 1**	**5**
Total			239


No culture, reactor or WB-seropositive samples
B. abortus,biovar 1 was cultured from elk tissue. May include reactors or WB-seropositive elk
WB-seropositive elk
Reactors on standard serology
Dillon
Bozeman
Livingston
Ennis
Lima
Lakeview
Sage Creek
Everson Creek
North of China Town
Blacktail Ridge - Clark Canyon herd
North Portion of HD 302
South Portion of HD 302
HD 300
Sweetwater Hills
West of Ruby Reservoir
Greenhorns West Slope
Axolotl
Cherry - Morgan
Blacktail Herd
Wall Creek
Sun Ranch Area
East of Ennis
Cherry Creek
North of Big Sky
HD 301
Taylor Fork Herd
Tom Miner Basin
Southwest of Hebgen
North of Hebgen
NE Tobacco Roots
SW Tobacco Roots
South of 16 Mile Creek
Rees Hills
South of Porcupine Creek
South of Flathead Creek
West Side of Bridgers
South of Cottonwood Creek
South of Brackett Creek
South Ferry Creek
Trail Creek Area
North of Pine Creek
West Boulder -Greeley Herd
Elk_Deer_ Greycliff_Creeks Herd
Work Creek Herd
North of Eightmile
North of Mill Creek
Emigrant
8 mile to Rock Cr.
North of Sixmile
N Yell. North Area
N Yell. South Area
North of Emigrant Creek
Main Boulder Herd
West Fork Stillwater River
Fishtail Creek
West Rosebud Creek
Red Lodge Creek
Dry Creek
South of Red Lodge
300
301
302
310
311
313
314
315
316
317
320
322
323
324
325
326
327
328
330
333
360
361
362
393
520
560
575
502

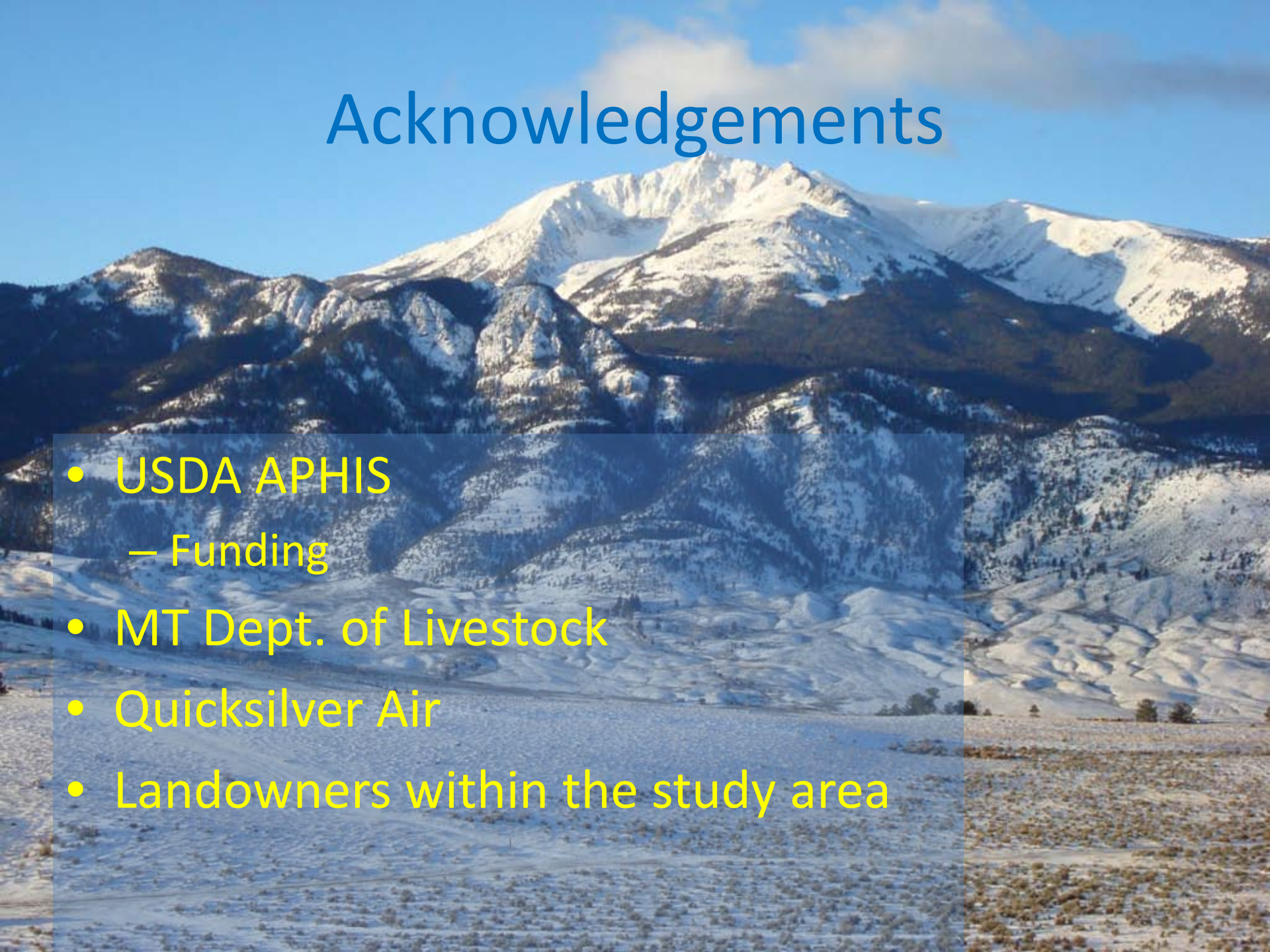
2011-2012 Project

- Focus on southwestern survey area
- Send kits to hunters
- Conduct capture/research in HD 325
  - Capture and test 100 cow elk
- Capture/test up to 30 elk in southern Pioneers
- Recapture seropositive elk from 2010-2011 Blacktail project



*Creating a working group to address elk management in areas with brucellosis.

Acknowledgements



- USDA APHIS
  - Funding
- MT Dept. of Livestock
- Quicksilver Air
- Landowners within the study area

Lessons from TB and Brucellosis

- Both originally disease of livestock
- Became established in wildlife
- Concentrating wildlife and livestock
- Transmission is two-way street
- Diseases largely eliminated in livestock
- Transmission now going other direction
- Best Management Practices
  - Avoid situations that put livestock and wildlife in very close proximity (sharing feed lines)